Review of: "Voice in Parkinson's Disease: A Machine Learning Study"

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We read with great interest the paper written by Suppa et al. in which they report the results of a case-control study in a PD population. They developed a voice parameter (LR score) and explored it as a biomarker of disease progression. They discussed its ability to distinguish PD patients and healthy controls, as well as early stages and mid-advanced stages. It was able to distinguish ON and OFF states and the researchers debated this result to emphasize the therapeutic effect of L-DOPA in the voice of PD patients.

The LR score emerges from a machine learning process based on acoustic analysis. Fundamental frequency (f_0) and shimmer are acoustic measures widely used and can be obtained by applying quick and inexpensive procedures. However, the authors analyzed 30 parameters using a relatively complex methodology that cannot be easily implemented in clinical practice. It is mentioned that the ideal biomarkers in PD require a safe, easy, and cheap methodology, however, it is not clear whether the LR score entirely fits this profile. As clinicians, we look forward to the authors continuing their work based on these promising results and transforming this LR score into something that we can use in clinical practice to increase the diagnostic accuracy of PD.

The authors claim to distinguish patients and healthy controls by voice, consequently, the groups should have been matched according to key voice determinants: sex and age. Sex has not been reported in the article, and age differs substantially (more than three years) between early-stage PD and healthy groups.

The multidimensional analysis of voice benefits from the use of PROM (patient-reported outcome measure). VHI is a reference standard PROM and aims to evaluate the psychosocial consequences of voice problems. Interestingly, the LR

score was able to detect voice changes before the patients did. However, the lack of perception regarding their own voice changes is a known characteristic of this population and also a matter of discussion[1,2.].In future studies, it would be interesting to compare the LR score with the clinical perception of an ENT doctor with the use of endoscopy/stroboscopy and/or SLP perceptual voice analysis with GRBAS, the standard reference tool[3].

The study concludes that voice is abnormal in early-stage PD. However, the mean VHI value reported (7.3±4.9) is below the VHI cut-off score mentioned in the Italian VHI version for healthy voice controls (10.40±6.5). Generally, a score of 10 points or less is considered normal[4–7]. On the other hand, VHI data for healthy subjects was not reported, therefore, it is unknown if their perception is within the cut-off score for 'normal' or not. These limitations allow us to question whether different criteria for abnormal voice in PD would generate similar results.

These results support the design of a future longitudinal study, which is also important for an adequate confirmation of a biomarker. The LR score should be studied to confirm the voice worsening throughout the course of the disease and to reproduce these results in other groups of patients who speak other languages and are in more advanced stages of cognitive decline. Future studies could explore the ability of the LR score to predict the type of neurodegenerative synucleinopathy and its correlation with severe complications in PD like aspiration pneumonia. Studies could also explore its ability to distinguish an old but healthy voice, a voice with PD features, or a voice with a disturbance but not with the PD profile[8].

The generated data are novel and interesting for researchers from different areas and their availability based on a request to the main author is a procedure to encourage and a sign of good practice in clinical research.

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